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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,282	06/26/2003	Yongjun Jeff Hu	MI22-2266	8289

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EXAMINER	
GURLEY, LYNNE ANN	
ART UNIT	**PAPER NUMBER**
2812	

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/609,282	HU, YONGJUN JEFF	
	Examiner	Art Unit	
	Lynne A. Gurley	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *82-97* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *82-97* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

LYNNE A. GURLEY
PRIMARY PATENT EXAMINER
TC 2800, AU 2812

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/19/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to RCE with amendment filed 4/19/05.

Currently, claims 82-97 are pending.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/19/05 has been entered.

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 82-97 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paek et al. (US 6,774,023, dated 8/10/04, filed 5/28/93) in view of Nakamura (JP 57194548, published 11/30/82).

Paek shows the method substantially as claimed in the abstract, and figures 1-2 and corresponding text, with emphasis on figures 3A-3B with a first refractory metal silicide 17 on a substrate 14 having a high melting point (column 3, column 4, lines 15-33 and 59-67; column 5, lines 1-10) and being metal enriched (x=2; column 3, lines 28-45), the first metal silicide layer having a thickness of at least about 50 Angstroms (column 4, lines 5-8) and comprising a predominant metal; forming a second metal silicide layer 18 over the first metal silicide layer, the second metal silicide layer having a bulk resistance of less than 30 micro-ohms-centimeter (figure 4). The first metal layer can be Ta, Mo, or W (column 4, lines 59-65). The metal of the second silicide is predominately different than the predominant metal of the first metal silicide. The metal-containing layer of the second metal silicide is Ti (column 4, lines 5-6). Thicknesses are given (column 4, lines 1-15). The substrate is silicon and has a polysilicon layer on top. The first metal silicide layer is formed directly against the silicon of the substrate (i.e. the silicon incorporated in the polysilicon layer, which is part of the substrate). Time and temperature for

conventional silicide formation is given (column 3, lines 28-44). Memory devices are disclosed as benefiting from the process (column 1, lines 1-27). The layers are patterned (see fig. 2).

Paek lacks anticipation only in not explicitly teaching that: 1) a metal-containing layer is directly formed against the first metal silicide layer; and after forming the metal-containing layer directly against the first metal silicide layer, converting the metal of the metal-containing layer to metal silicide to convert the metal-containing layer to a second metal silicide layer over the substrate; 2) the second metal silicide layer is incorporated into a bitline of an IC or, a wordline of an IC, with associated width; 3) forming a silicon nitride cap over the layer consisting essentially of silicon or conductively-doped silicon during the converting.

Nakamura teaches a method of forming a refractory metal silicide layer which prevents oxidation of the metal film prior to the formation of the silicide by depositing the refractory metal and then depositing a polysilicon layer (abstract; 300 Angstroms or greater depending on the thickness of the second refractory metal layer) on the refractory metal and then annealing to form the silicide. Temperatures in excess of 800 degrees C are disclosed for the silicide formation.

It would have been obvious to one of ordinary skill in the art to have formed the second metal silicide layer, in the method of Paek, by depositing the refractory metal layer capped with a polysilicon layer, as taught in the method of Nakamura, with the motivation that the formation of the second silicide by this method would prevent the oxidation of the refractory metal film prior to the silicide formation, thus making a more reliable silicide structure and silicon from the overlying layer would be incorporate into the second silicide layer at least. Additionally, the amount of silicon consumed from the substrate and underlying layers will be decreased,

depending on the application of the silicide layer. The combination of the methods of Paek and Nakamura is additionally strengthened by considering the first embodiment of Paek where the second metal of the second silicide layer is directly placed on the first metal of the first silicide layer before both metal layers are annealed to form a dual silicide layer. This implies that there would be no reservation of forming the second metal layer directly on the first silicide layer. Additionally, it would have been obvious to one of ordinary skill in the art to have formed a silicon nitride cap over the layer consisting essentially of silicon or conductively-doped silicon during the converting for further protection of the layers against oxidation, since silicon nitride is often used as moisture impervious capping layer.

It would have been obvious to one of ordinary skill in the art to have incorporated the second metal silicide layer into a bitline of an IC or, a wordline of an IC, with associated width, in the method of Paek as modified by Nakamura, with the motivation that the bitline and wordline formation often incorporates silicide formation as a means of reliable and low resistance performance (Paek, column 1, lines 1-26).

Response to Arguments

5. Applicant's arguments filed 4/19/05 have been fully considered but they are not persuasive.

6. In response to Applicant's remarks, pages 8-10, the Examiner takes the position that the combination of Paek with Nakamura meets the claim limitations. The combination of Paek with Nakamura teaches the silicon-containing layer, which is formed directly against the metal-containing layer, which is formed on an opposing side of the metal-containing layer from the

first metal silicide layer, by suggesting the benefits of the process are prevention of oxide formation before the silicide is formed, as well as decreased silicon substrate consumption.

Conclusion

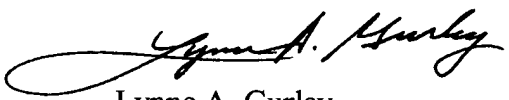
7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 571-272-1670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Lynne A. Gurley
Primary Patent Examiner
TC 2800, Art Unit 2812

LAG
February 7, 2005